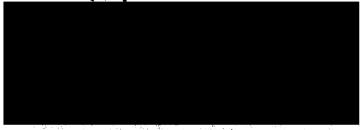
Approved For Release 2000/08/29 : CIA-RDP78-04861A000300050001-5



A new series of ferromagnetic substances: the ferrites of the rare earths

H. Forestier and G. Guiot-Guillain

Comptes Rendus de l'Academie des Sciences, Paris 230, 21 (22 May, 1950) 1844-1845

(from French)

Summary. Preparation of a new series of ferromagnetic compounds of the ferrites type, corresponding to the general formula Fe₂O₃, M₂O₃, in which M represents one of the elements of the rare earths; study of their stability and the variation of their magnetisation as a function of the temperature.

The general method of coprecipitation made it possible for one of us(1) to prepare in the pure state a series of compounds of the type Fe₂O₃ MO (ferrites) and to demonstrate their magnetic properties. We adopted this method (frequently made use of since then) to attempt to obtain a new series of ferromagnetic substances of the type Fe₂O₃, where M stands for one of the rare earths La Pr Nd Sm Er and Y.

The reaction Fe₂O₃ + M₂O₃ = Fe₂O₃.M₂O₃ is brought about by reheating of the correcipitated mixture of the corresponding oxides. They are stable at high temperature (1000°C). Fe₂O₃.Nd₂O₃, however is decomposed by heating for several hours at 1000°, into Fe₂O₃ and Nd₂O₃ (identifiable by exemination in X-rays and the Curie point of Fe₂O₃); (identifiable by exemination in X-rays and the Ferrites which we here an analogy may be seen with certain unstable ferrites which we had already investigated (2).

The Curie Points occur for these ferrites of rare earths, at the following temperatures:

They are classified as follows, in descending order of magnetisation: Nd; Er; Y; Sm; Pr; La; magnetisation determined after heating above the Curie point followed by cooling in a field of 2000 gauss. For comparison we quote that nickel ferrites has, under the same experimental conditions, a magnetisation four times as great as Fe₂O₃.Nd₂O₃. We here reproduce the curves of thermomagnetic analysis, obtained by means of our recording apparatus.

On the other hand, ferrites of lanthanum and praseodimium show to a marked degree, the phenomenon of thermoremanent magnetism, discovered by one of us (3) in sesquioxide of rhombohedral ferric oxfde and the ferrites Fe₂0₃. MO. This magnetisation reaches a value 20 times greater than the initial magnetisation of Fe₂0₃, La₂0₃ and 10 times greater than that of Fe₂0₃ Pr₂0₃.

Except in the case of neodymium ferrites, we observed that the proportion of ferromagnetic ferrites formed (in general very small at a temperature of 700° , even after prolonged heating) remained

/less

less than 50% after prolonged heating at 900°. In this way we obtained, for example, with Fe203. Er203 after heating for 6 hours at 1000°, a product of which the magnetisation was three times as great as after heating for the same length of time at 920°. Such a high temperature was not necessary for the formation of the ferrites Fe203.MO (completely formed after heating for four hours at 900°).

Allow Allows and the second and the

On the other hand, for Fe₂O₃, Nd₂O₃ (unstable ferrites), the maximum magnetisation (which can be attributed to about 80% of the product formed, according to the X-ray spectrograms) was obtained by heating for three hours at 775°.

All these results demonstrate the existence of a new series of ferromagnetic substances, of which the crystalline structures are being investigated at present.

BIBLIOGRAPHY

- (1) H. FORESTIER Thesis Paris 1908
 - (2) H. FORESTIER and) C.R. de l'Acad.Sci. 193 (1931) 733.

 M. GALAND)
 H. FORESTIER and) C.R. de l'Acad.Sci. 199 (1934) 270.
 G. GUIOT-GUILLAIN)
 H.FORESTIER and) C.R. de l'Acad.Sci. 203 (1936) 1160
 F. REDSLOB
- (3) H. FORESTIER Ann. de Chim. 10th series 9 (1928) 389
 H. FORESTIER and) C.R. de l'Acad. Sci. 183 (1926) 787
 G. CHAUDRON
 H. FORESTIER C.R. de l'Acad. Sci. 201 (1935) 45
 A. MICHEL and G. CHAUDRON
 C.R. de l'Acad. Sci. 200 (1935) 2171

DA/CCB.24.

TANT TO G

OFMALL

ire John IV will half

i e er

120

Might but by the D

Andrews that he was the first and the second section of the section of the

